STANDARDS FOR THE TRANSMISSION OF DIAGNOSTIC RESULTS FROM LABORATORY COMPUTERS TO OFFICE PRACTICE COMPUTERS -- AN INITIATIVE

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The computer can offer many benefits to medical practice -- prospective quality assurance, decision guidance, immediate access to patient data, displays tailored to specific problems, statitical estimates of patient outcomes based on the experience of similar patients and so on. A prerequisite to these benefits is getting patient data into a computerized medical record. There are a number of good examples of medical record systems that have been in operation for many years. Existing systems have solved the data capture problem by developing their own systems for clinical laboratory and pharmacies and/or by interfacing their medical record system with existing ancillary service programs. A few have solved the problem by heroic manual efforts. Overall, however, these successes have been few, and the migration of medical record applications to office practice has been slow.

The cost and reliability of both hardware and software have been barriers to wider use of medical record systems. But these problems will correct themselves with time as hardware becomes cheaper and software better. Time alone will not solve the problem of getting data into the computer. There are the problems and the costs of finding and training individuals to read and interpret paper reports and to type the results into a machine. There are associated delays, inaccuracies, and incompleteness. The cost and bother of all this could impose a long-term barrier to the use of computerized medical records in small practices.

In parallel to the development of medical record systems, other kinds of computer systems have arisen. There are computerized lab systems, computerized pharmacy systems, word processing systems for radiologists and consultants of many stripes. In the practitioner's office, we find incresing numbers of business computers for registration, billing and other administrative functions. Thus we find increasingly that medical record information is stored electronically -- in the lab computer, the radiologist's computer -- but not in the office practitioner's computer. What we need is a way to move the data from the computer where it is stored to the computer where it is needed. This requires the development of transmission standards and conventions.[1] Today we wish to grapple with the problems of developing such standards.

For brevity's sake, we will include any diagnostic study, treatment record or consultation report or component thereof in the rubric, a clinical observation.

Standards for clinical data transmission must address four issues.

1. What items of information should be included in the definition of an observation?

2. What data structure should be employed to record the observation?

3. How should the individual items be encoded or formatted?

4. What transmission media should be supported?

A clinical observation is a vector which contains at least four separate items. The first three items answer the question of what, when and who; that is, what is the observation (e.g., a chest X-ray or a serum potassium), when was it observed, and who was the patient. The fourth is the actual result, i.e., "4.5" for a serum potassium, "pneumonia" for a chest X-ray. There are other items that could be associated with the result. For example, an identifier for the result producer (e.g., "lab XYZ" or "Dr. Jones"), the identifier of the result requestor, the date and time the results were reported (often different from the date and time of the observation). Which of these items, or others that could be imagined, should actually be part of the definition of a result is something that must be decided.

What are the structural alternatives? Should the observation record contain fixed or variable length fields? If variable length, should separator marks or character counts define the fields? The structure itself could be variable in which case the record must contain information defining this structure. This variable structure approach has been taken by many spreadsheet programs and the ANSI Committee for General Exchange Standards.[2]

There are questions about the formatting and coding of individual data items. Should the date and time be the number of years from an offset date? Or should it be one of the readable formats

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(for example, DD/MM/YY or MM/DD/YY)? An ANSI standard for date coding exists, but it is so encompassing that a more restrictive standard might be preferred for efficiency's sake.[3]

For encoding the identity of a test or a patient we might consider the use of existing codes (for example, the social security number for patients and CPT codes for the procedure or observation). There would be problems. Some patients share a single social security number. Other patients have no such number. Finally, the use of the social security number is restricted by law. The use of CPT codes also presents problems. Unique codes are not available for all clinical tests, nor for important subcomponents of tests such as the differential count or the urinalysis.

An alternative would be to take advantage of the two-way nature of test request and reporting. In manual systems, the practitioner is free to add any information to the request form and it returns with the results. If the computer could do the same with the electronic analogue -- and send the practice's own labels for the patient (the chart number or internal ID number) and test (test name preferred by the practice) and this information could be returned with the result -- the requesting computer could file the results according to what ever convention was chosen by the practice. Physicians could choose to give different test names to the same species of test (for example, serum parathormone) from laboratories with quite different normal ranges. There would be less threat to privacy with this approach (though encription might be employed in either case) and agreement might be more easily reached by a standards committee since there would be less to agree upon.

There are many possible coding schemes for the observations themselves but at this stage the use of free text -- perhaps with subdivisions -- would be the easiest. More difficult problems of full coding of medical information could be left to the future. Perhaps by that time computers would be around that could understand free text and obviate the coding problem.

At the present there are at least two potential media for communicating results between producers and requestors. The first is the telephone. Current modem technology with auto-dialers and auto-answer capabilities could easily support such communication. The second possibility is paper with bar codes. Wand readers and matrix printers that can print bar codes are inexpensive and reliable.

All of the above is only intended as a starting point for discussion. There may be other and far better solutions to the problems of data exchange. We look forward to the discussion of the panel members and the audience regarding these important matters.

REFERENCES

1. McDonald CJ, Park BH, Blevins L: Grocers, physicians, and electronic data processing. Cont Med Educ Newsletter of the AMA 1983; 12:5-8.

2. Representation of data elements. ISO/TC 97/SC 14, 1980. British Standards Institution, London.

2. Representations for calendar dates and ordinal dates for information exchange. ANSI X 3.30, 1971. American National Standards Institute, Washington, DC.